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Outpatient Physical Therapy Management Of A Patient Three Months Following Left Shoulder Arthroscopic Repair Of A Type-II SLAP Lesion: A Case Report

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The patient signed an informed consent allowing the use of medical information and video footage for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

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Abstract

Background and Purpose

Research demonstrates a drastic increase in the prevalence of type-II superior labral anterior-posterior (SLAP) lesion repairs, and its surgical correction has become the favored method of treatment, because of its ability to effectively improve quality of life (QOL). The purpose of this case report is to document the examination, evaluation, and plan of care (POC) concerning a patient who was referred to physical therapy (PT) three months following the surgical correction of a type-II SLAP lesion.

Case Description

The patient was a middle-aged male who was referred to PT for evaluation and treatment following an arthroscopic repair of his left shoulder to correct a type-II SLAP lesion. The POC consisted of modalities and procedural interventions that were directed to decrease his pain and improve his left shoulder range of motion (ROM), muscle weakness, poor postural awareness, and abnormal scapulohumeral rhythm in preparation for his return to work without restrictions.

Outcomes

The patient reported minimal discomfort and demonstrated vastly improved left shoulder ROM, strength, postural awareness, and scapulohumeral rhythm upon the conclusion of his POC. According to the Upper Extremity Functional Index (UEFI), which was completed throughout his POC, he had eliminated his impairments and returned to his pre-injury QOL before discharge. The patient was capable of returning to work free of restrictions.

Discussion

The patient was an excellent candidate for PT because of his perfect attendance and compliance with his home exercise program. Although his impairments and functional limitations were unique to him as an individual, his thoroughly documented POC could be beneficial to other physical therapists, who are treating an individual with a similar diagnosis.

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Background and Purpose

As the prevalence of arthroscopic repairs to correct type-II superior labrum anterior-posterior (SLAP) lesions continue to rise, the importance of post-surgical physical therapy (PT) following this procedure has become critical. Gamradt et al.[1] reported that there has been a 105 percent increase in type-II SLAP repairs, from 2004 to 2009, which was three times higher than expected. Lombara and Matlick[2] stated that the glenoid labrum, which consists of fibrocartilage tissue and surrounds the glenohumeral joint, increases joint stability by limiting humeral head translation and increasing concavity of the glenoid fossa. A type-II SLAP lesion consists of fraying and degenerative changes to the superior labrum, in an anterior to posterior direction, with the biceps tendon detached from the glenoid.[2] See Appendix 1 for descriptions of SLAP lesion categories. Allen et al.[3] reported that the etiology of this injury consists of either a traumatic event or repetitive overhead activities which both compress the superior labrum, or a traction injury with eccentric contraction of the biceps. Research shows that men are three times more likely to receive a SLAP lesion repair than women and that the highest incident of this surgical procedure occurs between 20-29 and 40-49 years of age.[1]

The typical signs and symptoms of a SLAP lesion consist of anterior shoulder pain, impaired range of motion (ROM) and strength, shoulder instability, difficulty with overhead activities, and complaints of catching or popping.[2] Although some special tests may indicate a SLAP lesion, diagnostic imaging such as magnetic resonance imaging (MRI) typically assist with the diagnosis, and the diagnostic gold standard is an arthroscopic assessment.[2]

The evolution of surgical treatment for a type-II SLAP lesion has made the surgical approach more favorable.[3] The surgical routine begins with the patient being placed in the modified beach chair position, with their affected extremity positioned in an arm holder, and then placed under regional anesthesia before testing passive range of motion (PROM) in all directions to identify instability.[3] The modified beach chair position consists of the patient in 45° of side-lying, the head of the table elevated to 30°, and 10 pounds of longitudinal traction applied to their surgical extremity that is positioned in 30° of flexion and abduction.[4] The posterior

and antero-superior surgical portals are created to carry out the procedure. Once a type-II SLAP lesion is identified, the surgeon will debride the superior aspect of the glenoid to promote healing and anchor the labrum with suture anchors.[3] The anchors are placed anterior and posterior to the biceps tendon, with the number of anchors variable to the lesion size, and fixation is secured with arthroscopic knot-tying techniques.[3] See Figure 1 for images of a type-II SLAP lesion and its surgical correction.

Following this procedure, the patient's surgical extremity is placed in a brace and PT traditionally begins immediately. The PT follows a surgical protocol that consists of gradual PROM, active range of motion (AROM), and strengthening over the course of six to nine months. See Appendix 2 for an example of a detailed post-surgical protocol.

The increased prevalence of treating a patient with a type-II SLAP lesion repair, and a protocol that delayed the start of PT for this patient, made this case a necessary addition to the existing literature. This is a unique case since the patient was not referred to PT until three months post-surgery. The purpose of this case report is to document the examination, evaluation, and plan of care (POC) concerning a patient that was referred to PT three months following the surgical correction of a type-II SLAP lesion.

Case Description

Patient History and Systems Review

The patient, who will be referred to as "DB," gave his consent to participate in this case report. DB, a 45 year-old male, was referred to PT for evaluation and treatment following an arthroscopic repair to correct a type-II SLAP lesion within his left shoulder. DB reported that he originally injured his left shoulder one-year prior when lifting an object at work. He stated that he experienced pain immediately following the incident and that it worsened within an hour. He was referred to PT after an appointment with workplace health, and received four weeks of PT and a cortisone injection with no improvements, before he underwent an MRI and surgical repair approximately one-year later. DB reported that his left shoulder remained in a brace for three months following the surgery and that he was not allowed to lift

anything. He stated that his surgeon made a referral to PT, following his three-month post-surgical appointment, and allowed him to return to work under strict restrictions. These consisted of no lifting more than 15 pounds, overhead lifting, or pushing/pulling.

DB stated that he worked for a local tire company where he loaded, transported, and unloaded tractor-trailer tires throughout the region. He reported that his work duties were strenuous, because some tires weighed nearly 500 pounds, which made it difficult to use proper lifting mechanics. DB reported that he lived at home, with his wife and 16 year-old son, who have been helpful with household activities. He believed that he was in generally good health. Although he did not exercise regularly, he reported that his profession was physically demanding, that he did not smoke, and that he quit drinking alcohol five years ago. DB reported that he enjoyed spending time with his family, volunteering with the fire department, fishing, and hunting. His medical history consisted of well-controlled asthma and an abdominal hernia repair with no residual issues. His surgical history was not relevant to this case and he reported that he did not take any medications. DB did not have any notable co-morbidities that could have negatively impacted his prognosis.

DB reported that his chief complaints consisted of left shoulder pain, decreased motion, muscle weakness, and difficulty sleeping following the surgery. He described the pain as a burning and stabbing sensation throughout his left shoulder, which was increased with activity, and decreased with rest and ice. He reported that this pain caused difficulty with overhead activities, household chores, washing his hair, getting dressed, driving, volunteering at the fire department, and returning to work without restrictions. Following the systems review, it was evident that he had increased left shoulder pain, decreased ROM, and muscle weakness. He also demonstrated poor sitting/standing posture and an abnormal gait pattern. See Table 1 for results of the systems review.

DB's goals were to eliminate his daily left shoulder pain, improve his ability to lift objects, perform overhead activities, complete long distances drives, and return to work and volunteering at the fire department without restrictions.

Clinical Impression One

DB's primary problems consisted of increased left shoulder pain, decreased ROM, muscle weakness, poor postural awareness, and compensatory movements following the arthroscopic correction of a type-II SLAP lesion within his left shoulder. These impairments negatively impacted DB's functional status with self-care tasks and work-related activities. There were no potential differential diagnoses, since his pre-surgical MRI was indicative of a type-II SLAP lesion, and he was referred to PT following its surgical correction.

Following the patient history and systems review, it was evident that DB would benefit from further examination through specific tests and measures. There were no special tests performed since his diagnosis was pre-determined. He also completed the Upper Extremity Functional Index (UEFI) outcome measure during his initial evaluation to help determine improvements in quality of life (QOL) throughout his POC.

DB continued to be an excellent candidate for a case report because of his positive attitude, perfect attendance, and compliance with home exercise programs (HEP's) that helped him make significant progress. DB was also a good candidate because of his unique situation, where he was not referred to PT until three months following surgery. This delayed referral made the typical post-surgical protocol obsolete, and led to a more individualized POC for DB, where he was treated with interventions that could be progressed as tolerated. We anticipated DB would benefit from PT to minimize these impairments, and improve his functional status for self-care independence, in preparation for his return to work without restrictions.

Exam – Tests and Measures

Upon the completion of his systems review, various tests and measures were performed to determine his most severe impairments. These consisted of palpation, goniometry, manual muscle testing, joint play assessment, and postural/gait analysis. Special tests of his left shoulder were not performed. DB completed the UEFI at his initial evaluation, re-evaluation, and before his discharge from PT to determine improvements in his QOL. See Table 2 for results of tests and measures.

Palpation

In order to localize the pain within DB's left shoulder, specific landmarks were palpated to elicit any potential trigger points or tenderness. Bron et al.[5] performed a study where three blinded raters attempted to locate 12 myofascial trigger points (MTrP's), within the bilateral shoulders of 40 subjects diagnosed with shoulder pain, through palpation of the infraspinatus, biceps brachii, and anterior deltoids. Results of the research demonstrated acceptable inter-rater reliability with >70 percent pair-wise agreement for both referred pain sensation and jump sign upon palpation of MTrP's.[5]

Goniometry

In order to determine the severity of DB's decreased ROM, goniometry was performed for all bilateral shoulder and cervical motions. The comparison of measurements, from his affected side to his unaffected side, helped determine exactly what motion he was lacking. Norkin and White[6] reported that the ROM of an extremity, when measured using a universal goniometer, has generally shown good-to-excellent reliability. DB's joint measurements were performed using the same bony landmarks, goniometer, and rater throughout his POC to help maintain acceptable reliability.

Manual Muscle Testing (MMT)

The muscle weakness that was evident throughout DB's systems review, along with his poor upper body posture, led to the MMT of specific cervical, shoulder, and periscapular musculature. The comparison of his MMT grades, from his affected side to his unaffected side, helped determine the severity of his weakness. Cuthbert and Goodheart[7] reported that MMT attained high agreement, with inter-examiner reliability of 82-97% and test-retest reliability of 96-98%, when accepting plus/minus one grade. Although these were positive results, the study ultimately demonstrated that MMT scores must change more than one complete grade to be confident that a true change in strength occurred.[7]

Joint Play Assessment

DB's joint play of his bilateral shoulders was assessed, in order to determine whether his ROM deficits were the result of capsular tightness, or decreased strength and tight musculature secondary to disuse atrophy and pain.

Postural/Gait Analysis

DB's posture was assessed to determine any potential muscle imbalances throughout his upper body. His gait pattern was assessed to determine the mechanics of his upper body during ambulation.

Visual Analog Scale (VAS)

The VAS was used to determine the severity of DB's pain. It is a numerical (0-10) scale, where the severity of pain increases in linear fashion, and it is commonly used within the treating facility. DB reported his pain as a 2/10 during the evaluation, 9/10 at its worst, and 0/10 at its best.

Upper Extremity Functional Index (UEFI)

DB performed the UEFI during his initial evaluation, re-evaluation, and discharge to help determine changes in his QOL throughout the POC. This outcome measure is a 20 item self-report questionnaire, where each item is scored on a five-point Likert scale, and it helps reveal specific activities that may be more difficult for the patient to perform. According to Binkley et al.,[8] the UEFI has excellent test-retest reliability and internal consistency with coefficients of 0.95 and 0.94 respectively.

Clinical Impression Two

Upon the conclusion of the tests and measures, it was evident that DB presented with left shoulder pain, decreased ROM, and muscle weakness secondary to the arthroscopic correction of his type-II SLAP lesion. DB demonstrated poor postural awareness and compensatory movements that negatively impacted the use of his left shoulder. These impairments affected DB's functional status with household chores, self-care tasks, upper body dressing, overhead reaching, volunteering at the fire station, prolonged driving, and work-related lifting activities. DB continued to remain under work restrictions that consisted of no lifting greater than 15 pounds, overhead lifting, or pushing/pulling. DB would benefit from skilled PT to minimize

these impairments, and improve upon his functional status for self-care independence, in preparation for his return to work without restrictions.

DB's PT diagnosis was Pattern 4I (Impaired Joint Mobility, Motor Function, Motor Performance, and Range of Motion Associated With Bony or Soft Tissue Surgery).[9] DB had an excellent prognosis for improvement throughout PT and we anticipated that he was likely to achieve the majority of his therapeutic goals. DB's likelihood for success was based upon the strength and ROM of his unaffected shoulder, excellent attendance throughout his POC, and compliance with HEP's.

The final decision was made to have DB attend two PT sessions per week for a total of eight weeks. His POC originally consisted of palliative methods to reduce pain, and PROM/active assisted ROM (AAROM) exercises to improve his motion, before being progressed to active ROM (AROM) and strengthening exercises of increased difficulty. There was no need for DB to be referred to other services at that time and a re-evaluation was performed during the fourth week of PT. See Table 3 for DB's short and long-term goals.

Interventions

Coordination, Communication, and Documentation

We coordinated and communicated with DB himself, his orthopedic surgeon, and the physical therapy assistant (PTA) and athletic trainer (AT) who worked within the clinic. We made sure that DB understood his diagnosis, surgical correction, restrictions, and every aspect concerning his POC. The coordination and communication with his orthopedic surgeon was critical, to ensure that we understood the surgical procedure and any updates concerning his restrictions throughout the POC. In terms of communication and coordination with the PTA and AT within our clinic, we kept them up to date with DB's progress throughout his POC to ensure that each treatment session consisted of the most effective interventions.

We provided proper documentation for every aspect of DB's POC. This included his initial evaluation, daily notes, progress notes, re-evaluation at four weeks, and discharge note. The documentation was provided to include alterations within his POC, progress towards his therapeutic goals, and changes concerning his

interventions. This allowed other medical professionals to remain up to date concerning his progress and ensured reimbursement for his treatments.

Patient/Client Related Instruction

We provided proper patient/client related instruction on a regular basis. We educated DB on his final diagnosis and the process of his surgical correction through explanation of the shoulder anatomy. After his initial evaluation, we educated DB on his specific impairments, how they resulted in his functional limitations, and how PT would help him complete his therapeutic goals. Throughout his POC, we instructed him on how to perform therapeutic exercises with proper technique, educated him on the rationale behind the selection or alteration of specific interventions, and stressed the importance of continued compliance with his HEP.

Procedural Interventions

With the combination of clinical judgment and evidence-based research, we chose interventions that would minimize his impairments and improve his activity limitations/participation restrictions. We decided that it was imperative to minimize his reports of left shoulder pain before beginning more aggressive interventions. We decided that it would be beneficial for DB to receive phonophoresis with hydrocortisone. We theorized that the application of topical hydrocortisone, with the help of ultrasound to propel it towards the desired target area, would decrease inflammation and improve local circulation to eliminate DB's pain and increase tissue extensibility. Sarrafzedah et al.[10] reported that phonophoresis with hydrocortisone (1%) was more effective than ultrasound alone when attempting to alleviate latent myofascial trigger points.

The next two impairments addressed were DB's decreased shoulder ROM and muscular tightness. DB was first instructed to perform pendulum exercises and specific stretching exercises for improved ROM and posture. These stretches were aimed to improve his internal rotators, upper trapezii, and pectorals. Kisner and Colby[11] reported that static stretching is an effective and safe method to improve flexibility and ROM. DB eventually progressed to AAROM exercises using the pulley system for improved shoulder flexion and abduction. An involved extremity can be effectively assisted throughout its ROM through the use of pulley systems when

taught proper techniques.[11] If DB entered the clinic with increased discomfort, then we would perform PROM and glenohumeral distraction of his left shoulder, for improved motion without pain. Gently applied distraction of a joint is capable of controlling and relieving pain.[11]

We addressed his muscle weakness with therapeutic exercises. We initially instructed DB to perform TheraBand™† exercises to strengthen his shoulder extensors, adductors, and internal/external rotators. TheraBand™ exercises proved to be an effective intervention for improved strength in our clinical experience. He was later progressed to weighted pulley exercises to strengthen the same musculature. The weighted pulleys are more gravity dependent and the increased resistance is an effective progression from TheraBand™ activities. DB was eventually progressed to box lifting with proper mechanics once his restrictions were lifted. This was performed to simulate his work-related activities in preparation of his return to work.

In terms of DB's poor postural strength and awareness, we strengthened specific musculature to improve his upper body posture. We instructed DB to perform prone dumbbell exercises on a plinth that consisted of forward shoulder flexion, extension, and horizontal abduction to strengthen his rhomboids and middle/low trapezii. DB also performed cable machine rows and latissimus dorsi pull-downs to further strengthen his posterior musculature. He was later progressed to scapular punches and clocks in the supine position with dumbbells to further improve his postural stability. Eventually, DB progressed to closed-chain exercises in the quadruped position. The axial loading in quadruped, for increased joint congruency through approximation, can ultimately improve stability.[11] Lastly, DB progressed to Body Blade®‡ exercises for improved postural strength and stability. Buteau et al.[12] reported that the Body Blade® was a beneficial intervention, towards functional strengthening of an affected extremity, with improvements of 90% on the WOSI and no deficits on the SPADI upon discharge.

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† The Hygenic Corporation – 1245 Home Ave. Akron, OH 44310
‡ Mad Dogg Athletics – 2111 Narcissus Court Venice, CA 90291

DB's scapulohumeral rhythm was improved through education of proper body mechanics and external cues for long-term carryover. Verbal cues were immediately provided whenever DB displayed an abnormal scapulohumeral rhythm. If verbal cues seemed insufficient, then tactile cues to his upper trapezii were performed for muscle inhibition and prevention of shoulder shrugging. See Table 4 and Appendix 3 for detailed descriptions of interventions and parameters.

Outcomes

DB responded very well throughout his POC, minimized his impairments, and eliminated his functional limitations before his discharge. Following the initial evaluation, it was evident that DB experienced significant left shoulder pain, decreased left shoulder ROM, weakness throughout his left shoulder and peri-scapular musculature, and poor postural awareness. Upon the conclusion of PT, he reported that he experienced no left shoulder pain and demonstrated improved left shoulder ROM, muscular strength, postural strength and awareness, and a normalized scapulohumeral rhythm. As DB continued to progress, we decreased his POC to one day per week with an increased emphasis on his HEP, which was updated regularly as he progressed within the clinic. Ultimately, DB reported that he could return to work, volunteer at the fire station, and perform all self-care activities without restrictions. He stated that his QOL had returned to its pre-injury status and the UEFI that he completed before discharge reported that he had no impairments. DB achieved all of his therapeutic goals before his discharge from PT. See Table 5 for a detailed comparison of DB's discharge status to his original baseline upon admission.

Discussion

In conclusion, DB was evaluated following the surgical correction of his type-II SLAP lesion and his POC was thoroughly documented. As previously stated, the prevalence of type-II SLAP lesion repairs has raised dramatically within recent years,[1] which has increased the importance of adding to the existing literature. The surgical repair of a type-II SLAP lesion has proven to be effective and the majority of patients report satisfaction with their post-surgical outcomes.[3] Furthermore, in the case of patients like DB who suffered a traumatic event, there is an increased

likelihood of returning to their previous sport.[3] Although DB was not an athlete, he returned to his work free of restrictions.

Although DB presented with a more unique case, since he did not receive PT until three months post-surgery, we strongly believe that this will be a beneficial addition to the existing literature. Throughout his POC, DB demonstrated continuous progress and achieved all of his therapeutic goals. We understand that no individual case is the same, but DB's well-documented POC could be helpful for therapists dealing with a similar patient population.

In terms of future research, it would be beneficial to determine whether or not immediate post-operative PT is more beneficial than DB's delayed referral to PT. It would also be beneficial to determine when it is most effective to implement closed-chain exercises for improved postural stability. Lastly, it would be beneficial to understand the most effective method to ensure long-term carryover for improved scapulohumeral rhythm after discharge.

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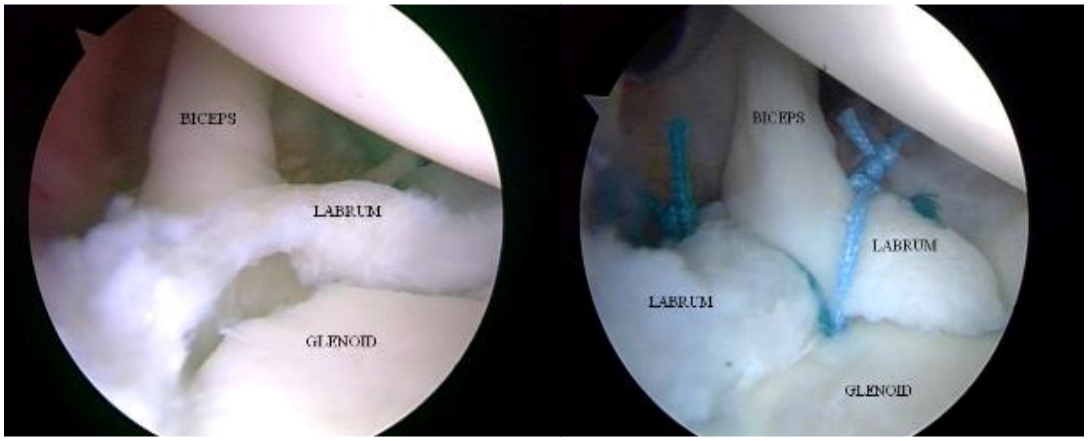
Figures and Tables

Figure 1: Image of Type-II SLAP Lesion and Arthroscopic Correction



Left: Image of a type-II SLAP lesion where labrum and biceps are detached from the glenoid. **Right**: Image following the surgical correction of the type-II SLAP lesion. The Shoulder Center. (2014). Labrum Tear (SLAP Lesion). Retrieved From: http://www.theshouldercenter.com/labrum-tear-slap-lesion/

Table 1: Results of Systems Review

Cardiovascular/Pulmonary	
Not Impaired	Patient presents with blood pressure, heart rate, and respiratory rate that is all WNL Patient has no observable edema.
Integumentary	
Impaired	Patient presents with a well-healed and pliable surgical scar, on the antero-superior aspect of his left shoulder, with no signs of infection.
Musculoskeletal System	
Impaired Range of Motion	Patient presents with gross ROM impairments throughout his left-sided cervical and left shoulder motion.
Impaired Strength	Patient presents with impaired strength of his left cervical musculature, left shoulder/elbow, and periscapular musculature.
Impaired Sitting/Standing Posture	Patient presents with rounded shoulders, forward head, depressed left shoulder, and tends to guard his left shoulder into internal rotation with the arm placed across his

	body.
Impaired Gait Pattern	Patient demonstrates minimal thoracic trunk rotation and minimal bilateral arm swing during ambulation.
Neuromuscular	
Not Impaired	Patient presents with normalized sitting/standing balance and coordination.
Communication, Affect, Cognition, and Learning Style	
Not Impaired	Patient presents with intact communication, normal affect, is A&O x3, and prefers demonstrations and pictures.

Table 2: Examination (Tests and Measures)

Palpation		
Patient presents with tenderness to palpation of the left sub-acromial space. Patient presents with tightness throughout bilateral thoraco-cervical paraspinals and left rotator cuff, biceps, and deltoids.		
Goniometry – AROM		
Cervical		
Motion	**Left**	**Right**
Flexion	45 Degrees	
Extension	50 Degrees	
Side-Bend	40 Degrees	55 Degrees
Rotation	75 Degrees w/ Pain	80 Degrees
Shoulder		
Motion	**Left**	**Right**
Flexion	150 Degrees w/ Shrug Sign	172 Degrees
Extension	45 Degrees w/ Shrug Sign	45 Degrees
Abduction	140 Degrees	165 Degrees
External Rotation	Functional To L2 w/ Pain	Functional To T12
Internal Rotation	Functional To C4 w/ Pain	Functional To T1
Elbow		
Motion	**Left**	**Right**
Flexion	WNL	WNL
Extension	WNL	WNL
Manual Muscle Test		
Cervical		
Muscle	**Left**	**Right**
Flexion	5/5	
Extension	5/5	
Side-Bend	4/5	5/5
Rotation	4/5 w/ Pain	5/5
Shoulder		
Muscle	**Left**	**Right**
Flexion	4-/5	5/5
Extension	4+/5	5/5
Abduction	4-/5	5/5

Adduction	4/5	5/5
External Rotation	4-/5 w/ Pain	5/5
Internal Rotation	4/5 w/ Pain	5/5
Elbow		
Muscle	**Left**	**Right**
Flexion	4+/5	5/5
Extension	4+/5	5/5
Periscapular Musculature		
Muscle	**Left**	**Right**
Upper Trapezius	5/5	5/5
Middle Trapezius	4-/5	4/5
Lower Trapezius	4-/5	4/5
Rhomboids	3+/5	4/5
Joint Mobilization		
Direction	**Left**	**Right**
Inferior	3/6	3/6
Posterior	3/6	3/6
Anterior	3/6	3/6
Postural Analysis		
Patient presents with rounded shoulders, forward head, depressed left shoulder, and tends to guard his left shoulder into internal rotation with arm placed across his body.		
Gait Analysis		
Patient demonstrates minimal thoracic trunk rotation and bilateral arm swing during ambulation.		
Special Tests		
No special tests were performed during initial evaluation because of his referral for post-surgical left shoulder labral repair and increased pain.		
Visual Analog Scale (VAS)		
Left Shoulder (Anterior/Posterior/Superior)	**Current** – 2/10 **Worst** – 9/10 **Best** – 0/10	
Outcome Measures		
Outcome Measure	**Score**	**Impairment**
Upper Extremity Functional Index	19	24

AROM = Active Range of Motion and **w/** = With

Table 3: Short and Long Term Goals

Goal		**Time Duration**
LTG One	Patient's upper extremity range of motion will improve to allow patient to complete upper extremity dressing (donning/doffing shirt) without restrictions.	8 Weeks
STG 1a	Patient's left shoulder flexion and abduction active range of motion will both improve to 160 degrees.	4 Weeks
STG 1b	Patient's left shoulder internal rotation active range of motion will improve to allow patient to	4 Weeks

	functionally reach to T12.	
STG 1c	Patient's left shoulder external rotation active range of motion will improve to allow patient to functionally reach C7.	4 Weeks
LTG Two	Patient's upper extremity strength will improve to allow patient to allow patient to lift 5 pounds overhead for at least 10 repetitions with normalized mechanics.	8 Weeks
STG 2a	Patient's left shoulder flexion and abduction strength will improve to 5/5 in both planes.	4 Weeks
STG 2b	Patient's left shoulder internal and external rotation strength will improve to 5/5 in both planes.	4 Weeks
STG 2c	Patient will demonstrate a normalized scapulohumeral rhythm with shoulder flexion and abduction movements without external cues.	4 Weeks
LTG Three	Patient's postural strength and awareness will improve to allow patient to complete at least 10 repetitions of shoulder flexion in the quadruped position.	8 Weeks
STG 3a	Patient will maintain proper upper body posture for an entire session without external cues.	4 Weeks
STG 3b	Patient's periscapular strength will improve to at least 4+/5 in all planes.	4 Weeks
LTG Four	Patient will be independent in home exercise program for long-term carryover.	6 Weeks
LTG Five *	Patient's strength will improve to allow patient to lift a 50-pound object from floor to waist, while demonstrating proper lifting mechanics, without restrictions.	4 Weeks
STG 5a *	Patient will be capable of lifting a 30-pound box from floor to waist, while demonstrating proper lifting mechanics, no less than 10 times.	2 Weeks

LTG = Long Term Goal and **STG** = Short Term Goal

*** LTG (5)** and **STG (5a)** were implemented within the patient's plan of care following his re-evaluation and most recent follow-up appointment with his orthopedic surgeon

Table 4: Interventions and Parameters

Weeks	Interventions and Parameters				
	Pain Alleviation (Modality/Manual)	**Range of Motion**	**Stretching**	**Therapeutic Exercise**	**Postural Stability/Therapeutic Activity**
One	**Phonophoresis** Sub-Acromial Space, 1.0 watts/cm², 8 min, 1mH (Hydrocortisone)	**Pendulum Circles** 1x10, Both Directions, Left **UBE** 3 Minutes, Level 1 (Forward/Backward) **Pulley Flexion, Abduction, Scaption (AAROM)** 1x10, 10 Second Hold, Left	**Internal Rotation** 1x3, 20 Second Hold, Left (With Towel) **Upper Trapezius, Pectoral Corner, Posterior Capsule** 1x3, 20 Second Hold, Left	**Theraband Extension, Adduction, IR/ER,** 2x10, Orange, Left **Theraband Rows** 2x10, Orange, Bilateral	
Two	**Phonophoresis** Sub-Acromial Space, 1.0 watts/cm², 8 min, 1mH (Hydrocortisone)	**UBE** 3 Minutes, Level 4 (Forward/Backward) **Pulley Flexion, Abduction, Scaption (AAROM)** 1x10, 10 Second Hold, Left	**Upper Trapezius and Posterior Capsule** 1x3, 20 Second Hold, Left	**Theraband Extension, Adduction, IR/ER** 3x10, Orange, Left **Theraband Rows** 3x10, Orange, Bilateral	**Wall Push-Ups** 2x10
Three	**Phonophoresis** Sub-Acromial Space, 1.0 watts/cm², 8 min, 1mH (Hydrocortisone)	**UBE** 4 Minutes, Level 4 (Forward/Backward) **Pulley Flexion, Abduction, Scaption (AAROM)** 2x10, 10 Second Hold, Left	**Upper Trapezius, Posterior Capsule, and Pectoral Corner** 1x3, 20 Second Hold, Left	**Pulley Extension, Adduction, IR/ER** 2x10, 5 Pounds, Left **Hoist Machine Rows** 2x10, 30 Pounds	**Wall Push-Ups** 3x10 **Quadruped Shoulder Flexion** 1x10, Bilateral

Four		**UBE** 4 Minutes, Level 5 (Forward/Backward)	**Upper Trapezius, Posterior Capsule, and Pectoral Corner** 1x3, 20 Second Hold, Left	**Pulley Extension/ Adduction** 3x10, 7.5 Pounds, Left **Pulley IR/ER** 3x10, 5 Pounds, Left **Hoist Machine Rows** 3x10, 30 Pounds **Hoist Machine LAT Pull** 2x10, 30 Pounds **Standing Dumbbell Shoulder Flexion** 1x10, 2 Pounds, Left	**Supine Dumbbell Serratus Punch and Scapular Clocks** 1x10, 2 Pounds, Bilateral **Quadruped Lateral Shifts (BOSU)** 1x10 **Quadruped Circles (BOSU)** 1x10, Both Directions **Box Lift (Floor To Waist)** 1x10, 25 Pounds
Five	**Joint Mobilization (Glenohumeral Distraction)** 1x3, 30 Second Hold	**UBE** 5 Minutes, Level 5 (Forward/Backward) **Shoulder Flexion/Abduction With Scapular Stabilization (PROM)** 1x3, 30 Second Hold, Each		**Pulley Extension/Adduction** 3x20, 7.5 Pounds, Left **Pulley IR/ER** 3x10, 5 Pounds, Left **Hoist Machine Rows** 3x15, 50 Pounds **Hoist Machine LAT Pull** 2x15, 50 Pounds **Standing Dumbbell Shoulder Flexion and Abduction** 2x10, 3 Pounds, Left, Each Motion	**Supine Dumbbell Scapular Clocks** 3x10, 2 Pounds, Left **Box Lift (Floor To Waist)** 1x10, 30 Pounds
Six	**Joint Mobilization (Glenohumeral Distraction)**	**UBE** 5 Minutes, Level 5 (Forward/Backward)	**Triceps** 1x3, 20 Second Hold, Left	**Pulley Extension/Adduction** 3x20, 10 Pounds, Left	**Body Blade (90º Shoulder Flexion and Elbow Extension, 90º**

	1x3, 30 Second Hold **Ice Massage** 5 Minutes To Left Triceps			**Pulley IR/ER** 3x10, 7.5 Pounds, Left **Standing Dumbbell Shoulder Flexion/Abduction** 1x10, 3 Pounds, Left, Each Motion **Hoist Machine Row** 1x10, 100 Pounds **Hoist Machine LAT Pull** 1x10, 100 Pounds **Pulley D2 Flexion Pattern (PNF)** 2x10, 5 Pounds, Left	**Shoulder Abduction and Elbow Extension, Neutral Shoulder and 90º Elbow Flexion)** 1x2, 30 Second Hold With Oscillations, Each Position **Prone Shoulder Flexion, Horizontal Abduction, Extension** 1x10, 3 Pounds, Bilateral, Bilateral
Seven		**UBE** 5 Minutes, Level 5 (Forward/Backward)	**Patient Education** Continued Compliance With … **Stretching of Pectorals, Upper Trapezii, and Posterior Capsule** 1x3, 20 Second Hold, Left	**Patient Education** Continued Compliance With … **Theraband Rows and LAT Pulls** 3x10, Black, Bilateral **Prone Shoulder Flexion, Horizontal Abduction, Extension** 3x10, 3 Pounds, Bilateral	**Quadruped Lateral Shifts (BOSU)** 3x10 **Quadruped Circles (BOSU)** 3x10, Both Directions **Quadruped With Scapular Push Ups** 3x10 **Box Lift (Floor To Waist)** 1x10, 50 Pounds

UBE = Upper Body Ergometer, **AAROM** = Active Assisted Range of Motion, **PROM** = Passive Range of Motion, **IR** = Internal Rotation, **ER =** External Rotation, **LAT =** Latissimus Dorsi, and **PNF** = Proprioceptive Neuromuscular Facilitation

Table 5: Outcomes (Admission vs. Discharge)

Palpation	
Admission	**Discharge**
Tenderness Upon Palpation Left Sub-Acromial Space **Tightness Upon Palpation** Bilateral Thoraco-Cervical Paraspinals Left Rotator Cuff, Biceps, and Deltoids	**Tenderness Upon Palpation** None **Tightness Upon Palpation** None

Goniometry – AROM		
Cervical (Left)		
Motion	**Admission**	**Discharge**
Side-Bend	40 Degrees	55 Degrees
Rotation	75 Degrees w/ Pain	80 Degrees
Shoulder (Left)		
Motion	**Admission**	**Discharge**
Flexion	150 Degrees w/ Shrug Sign	170 Degrees
Extension	45 Degrees w/ Shrug Sign	45 Degrees
Abduction	140 Degrees	160 Degrees
Internal Rotation	Functional To L2 w/ Pain	Functional To T12
External Rotation	Functional To C4 w/ Pain	Functional To C7

Manual Muscle Test		
Cervical (Left)		
Muscle	**Admission**	**Discharge**
Side-Bend	4/5	5/5
Rotation	4/5 w/ Pain	5/5
Shoulder (Left)		
Muscle	**Admission**	**Discharge**
Flexion	4-/5	5/5
Extension	4+/5	5/5
Abduction	4-/5	5/5
Adduction	4/5	5/5
External Rotation	4-/5 w/ Pain	5/5
Internal Rotation	4-/5 w/ Pain	5/5
Elbow (Left)		
Muscle	**Admission**	**Discharge**
Extension	4+/5	5/5
Flexion	4+/5	5/5
Posterior Periscapular Musculature		
Muscle	**Admission**	**Discharge**
Middle Trapezius	4-/5 (Left) and 4/5 (Right)	4+/5 (Bilateral)
Lower Trapezius	4-/5 (Left) and 4/5 (Right)	4+/5 (Bilateral)
Rhomboids	3+/5 (Left) and 4/5 (Right)	4+/5 (Bilateral)

Postural Analysis (Sitting/Standing)	
Admission	**Discharge**
Rounded shoulders, forward head, and depression of left shoulder that is guarded into internal rotation	Normalized posture with minimal rounded shoulders/forward head and no guarding of left shoulder

Gait Analysis	
Admission	**Discharge**
Abnormal gait pattern with ambulation that consists of minimal thoracic trunk rotation/bilateral arm swing	Normalized gait pattern with ambulation

Visual Analog Scale (VAS)		
Location	**Admission**	**Discharge**
Left Shoulder (Anterior/Posterior/Superior)	**Current** – 2/10 **Worst** – 9/10 **Best** – 0/10	**All Times** – 0/10

Outcome Measure (UEFI)	
Admission	**Discharge**
Score – 19 **Impairment** – 24	**Score** – 0 **Impairment** – 0

AROM = Active Range of Motion, **w/** = With, and **UEFI** = Upper Extremity Functional Index

Appendix

Appendix 1: Superior Labral Posterior-Anterior (SLAP) Categories

Type–I	Degenerative appearance and marked fraying of superior labrum. Firm attachment remains between peripheral edge of labrum and glenoid. Biceps tendon attachment remains intact with labrum.
Type–II	Similar degenerative and fraying appearance as seen with Type–I, but the superior labrum and biceps tendon attachment are stripped from the glenoid, which leads to an unstable labral-biceps anchor.
Type–III	The superior labrum demonstrates a bucket-handle tear. The central portion of the labrum is displaceable and the peripheral portion of the labrum remains attached to the glenoid and biceps tendon. The biceps tendon attachment remains intact as well.
Type–IV	The superior labrum has a bucket-handle tear similar to that seen in type-III, but the biceps tendon has a partial tear as well, which results in its displacement into the joint along with the labral flap.

Lombara A and Matlick D. (2014). Superior Labral Anterior Posterior (SLAP) Lesions. In S. Richman (Ed.), *CINAHL Rehabilitation Guide: Rehabilitation Reference Center* (July 4, 2014). Retrieved From: http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrc&AN=T709055&site=rrc-live

Appendix 2: Post-Surgical Protocol

Phase One (0-4 Weeks)	Passive ROM and Healing of Tissue
Phase Two (4-8 Weeks)	Improve ROM and Slow Transition To Strengthening
Phase Three (8-12 Weeks)	Progressive Strengthening, Continued ROM, and Scapulohumeral Rhythm
Phase Four (12-16 Weeks)	Progress Strengthening and Daily Activities
Phase Five (16-24 Weeks)	Return To Sport and Physical Activity Preparation

South Shore Hospital Orthopedics (Spine and Sports Therapy In Clinical Collaboration With South Shore Orthopedics). SLAP Repair Protocol. Retrieved From: http://www.southshoreorthopedics.com/downloads /SLAP_Repair.pdf

Appendix 3: Explanation of Interventions

Modalities (Pain Relief)	
Phonophoresis	DB was instructed to sit in a chair with his left shoulder in slight scaption and ER. Hydrocortisone was applied to the anterior aspect of his left shoulder within the sub-acromial space. Ultrasound was performed for 8 minutes at 1.0 watts/cm^2 and 1 mH.
Stretching and ROM Exercises (Improved ROM and Tissue Extensibility)	
Pendulum Exercises (AAROM)	DB was instructed to hold onto a table with his right hand and lean forward while maintaining a straight left arm. He was then instructed to use momentum to move his shoulder in a clockwise and counter-clockwise direction.
Internal Rotator Stretch	DB was instructed to place his right arm behind his head and left arm behind his back. He was then told to use the towel in his right hand to passively elevate his left arm.
Upper Trapezii Stretch	DB was instructed to place his left arm across his chest and to apply force with his right arm for increased stretch.
Pectoralis Major Stretch	DB was instructed to place his left arm across his chest and to apply force with his right arm for increased stretch.
Pulley System (AAROM)	DB was instructed to stand and grasp a pulley in each hand. He was then instructed to passively bring his left shoulder into both flexion and abduction by pulling down in the opposite direction with his non-affected right arm.
PROM	DB was instructed to lie supine on a plinth and to relax his left arm. Then, while holding his arm at mid-humerus and below the elbow, his left shoulder was gently moved throughout specific motions. These included shoulder flexion, abduction, scaption, and IR/ER.
Glenohumeral Distraction	DB was instructed to lie supine on a plinth and to relax his left arm. Then, while passively placing his elbow at 90 degrees of flexion and holding his distal humerus, a gentle distraction force was applied with his shoulder in slight flexion, abduction, and ER.
Therapeutic Exercises (General Left Shoulder Strengthening)	
Theraband Exercises	DB was instructed to remain standing and hold the theraband, which was anchored to the wall, within his left hand. He was then instructed to pull against the resistance through various shoulder motions. The included left shoulder extension, adduction, and IR/ER. He was progressed in the number of sets/repetitions before the band resistance was increased.
Weighted Pulleys	DB was instructed to remain standing and grasp the handle of the weighted pulley system. He was then instructed to pull against the resistance in the same motions as

	mentioned above for theraband exercises. He was progressed in the number of sets/repetitions before increasing the weighted resistance.
Functional Activities (Improved Functional Strength)	
Box Lifting	DB was instructed to lift a weighted box, from the floor to a table of waist height, with proper lifting mechanics. The weight of the box increased as the surgeon lifted his restrictions.
Therapeutic Exercises (Peri-Scapular Strengthening)	
Prone Dumbbell Exercises	DB was instructed to lie supine on a plinth with dumbbells in both hands. He was then instructed to move both of his shoulders into forward flexion, extension, and horizontal abduction. DB progressed in the number of sets/reps before increasing weight.
Cable Machine Rows	DB was instructed to grasp the bar with both hands in standing and to pull back in an effort to squeeze his shoulder blades together. DB was also instructed to keep his elbows close to his body throughout the motion.
Cable Machine Latissimus Dorsi Pull-Downs	DB was instructed to grasp the bar, with his arms straight at shoulder height, and to pull down towards his waist while maintaining straight arms and a neutral spine.
Scapular Punches	DB was instructed to lie supine on a table and hold a dumbbell within both hands while maintaining straight arms towards the ceiling. Then, he was instructed to thrust toward the ceiling and hold, in order to lift his shoulder blades off the table, while maintaining straight arms.
Scapular Clocks	DB was instructed to lie supine on a table and hold a dumbbell within both hands while maintaining straight arms towards the ceiling. Then, he was instructed to lift his shoulder off of the table and perform circular motions in both directions.
Body Blade Exercises	DB was instructed to grasp the middle handle of the body blade and to perform oscillations for 30-second time periods. He performed these oscillations in 90º of shoulder flexion with an extended elbow, 90º of shoulder abduction with an extended elbow, and 90º of elbow flexion with a neutral shoulder.
Quadruped Closed Chain Exercises (Improved Postural Stability and Strength)	
Forward Shoulder Flexion/Abduction	DB was instructed to assume the quadruped position on a table. Then, he was instructed to slowly lift his left arm into forward shoulder flexion and abduction, while maintaining a straight right arm and level back.
Lateral Weight Shifts	DB was instructed to assume the quadruped position on a table while placing both of his hands on a tilt board. Then, he was instructed to slowly shift his upper extremity weight

	side to side while maintaining a level back.
BOSU†† Ball Circles	DB was instructed to assume the quadruped position on a table while placing both of his hands on a BOSU ball. Then, he was instructed to perform clockwise and counter-clockwise motions while maintaining a level back.

ER = External Rotation**, mH** = Megahertz**, ROM** = Range of Motion**, AAROM =** Active Assisted Range of Motion**, PROM** = Passive Range of Motion, and **IR** = Internal Rotation

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